OK TO ENTER: /RZ/

Docket No.: 102133-16
Confirmation No.: 6840

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	:	10/589,293
APPLICANT	:	Manfred Danzinger
FILED	:	April 27, 2007
FOR	:	ADHESIVE BOND AND METHOD FOR THE PRODUCTION THEREOF
ART UNIT	:	1794
EXAMINER	:	Melissa K. Ryckman

Mail Stop AF
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

AMENDMENT UNDER 37 CFR 1.116

In response to the Final Office Action dated November 03, 2010, please amend the above-identified application as follows:

Amendment to the Claims are reflected in the listings of claims which begin on page 2 of this paper.

Remarks/Arguments begin on page 7 of this paper.

Amendments to the Claims:

This listing of claims will replace all prior versions, and listing, of claims in the application:

Listing of Claims:

1. (Currently amended) An adhesive bond between

a substrate material having material having a nano-indented surface and a nano-indented solid region proximate to the surface comprised of polymer compounds with a low active surface energy in a range of fluoropolymers, and

a second material deposited particle-by-particle on the nano-indented surface of the substrate material while the nano-indented surface of the substrate material is in an energetically excited state, wherein

a nano-structured transition region comprising nano-composites is formed between the nano-indented substrate material and the second material in such a way that the transition region has a layer thickness between 20 nm and 20 μm and is predominantly formed of nano-composites, and wherein

a ratio of substrate material to the second material in a direction transverse to the transition region changes from predominantly nano-indented substrate material in an immediate vicinity of the nano-indented substrate material to predominantly the second material in an immediate vicinity of the second material, with the nano-indented substrate material transitioning into the second material with a nano-structure.

2. (Previously Presented) The adhesive bond according to claim 1, wherein the transition region comprises metal fractions or metal compounds in form of nano composites containing metal polymers.

3. (Withdrawn - Previously Presented) The adhesive bond according to claim 1, wherein the transition region comprises diamond-like components.

4. (Withdrawn - Previously Presented) The adhesive bond according to claim 1, wherein the transition region comprises nano-composites containing fluoropolymers.

Claims 5 - 9 (Canceled).

10. (Currently amended) A composite structure comprising

a substrate material of a first composition having a nano-indented surface and a nano-indented solid region proximate to the surface comprised of a polymer compound with a ~~low-active~~ surface energy in a range of fluoropolymers,

a second material of a second composition disposed deposited particle-by-particle on the solid region of the nano-indented substrate while the nano-indented substrate is in an energetically exited state, and

a nano-structured transition region formed between the solid region of the nano-indented substrate and the second material, said nano-structured transition region having a layer thickness between 20 nm and 20 μm and comprising predominantly nano-composites,

wherein a composition of the nano-composites changes from a composition substantially identical to that of the nano-indented substrate material proximate to the nano-indented substrate material to a composition substantially identical to that of the second material proximate to the second material.

11. (Previously Presented) The composite structure of claim 10, wherein the nano-composites comprise metal fractions or metal compounds, or both.

12. (Previously Presented) The composite structure of claim 10, wherein the nano-composites comprise metal polymers.

13. (Withdrawn - Previously Presented) The composite structure of claim 10, wherein the nano-composites have a diamond structure.

14. (Withdrawn - Previously Presented) The composite structure of claim 10, wherein the nano-composites comprise α-C:H.

15. (Withdrawn - Previously Presented) The composite structure of claim 10, wherein the nano-composites comprise fluoropolymers.

16. (Withdrawn- currently amended) A method for producing an adhesive bond between a substrate material having a surface and a solid region proximate to the surface which includes polymer compounds with a ~~low active~~ surface energy in a range of fluoropolymers , and a second material, comprising the steps of:

nano-indenting a solid region of the substrate material proximate to the surface having the polymer compounds with ~~a low active~~ *the* surface energy to form a nano-indented surface,

activating the nano-indented surface by an excitation process which excites molecules of the polymer compounds, and

depositing the second material on the activated nano-indented surface particle-by-particle by a physical vapor deposition (PVD), by a chemical vapor deposition (CVD) process or by cathode sputtering, or by a combination thereof, while the polymer molecules are still in an energetically excited state, until the solid region proximate to the surface of the substrate material is completely covered with the second material.

17. (Withdrawn – Previously Presented) The method of claim 16, wherein the excitations process comprises a process selected from the group consisting of ion bombardment, ion beam processing, plasma processing, electron beam processing and laser beam processing.

18. (Withdrawn – Previously Presented) The method of claim 16, wherein the second material is deposited concurrently with activating the nano-indented surface.

19. (Withdrawn – Previously Presented) The method of claim 16, wherein the second material is deposited in parallel with activating the nano-indented surface.

20. (Withdrawn- Previously Presented) The method of claim 16, wherein nano-indenting the solid region of the substrate material proximate to the surface is performed in a separate process.

21. (Withdrawn – Previously Presented) The method of claim 16, wherein depositing the second material starts with a low deposition rate, with the deposition rate increasing continuously or step-wise until the second material completely covers the solid region proximate to the surface of the substrate material.

22. (Withdrawn – Previously Presented) The method of claim 16, wherein the second material is a non-metallic material, the method further comprising the step of depositing metal fractions on the activated nano-indented surface at least during a first phase of the particle-by-particle deposition of the second material.

23. (Withdrawn – Previously Presented) The method of claim 16, wherein the nano-indented surface is activated in a vacuum and the second material is also deposited particle-by-particle in a vacuum.

24. (Withdrawn – Previously Presented) The method of claim 23, wherein the vacuum has a pressure between approximately $1x10^{-1}$ mbar and $1x10^{-5}$ mbar.

25. (Previously Presented) The adhesive bond of claim 1, wherein the transition region comprises metal polymers.

26. (Withdrawn – Previously Presented) The adhesive bond of claim 1, wherein the transition region comprises nano-composites containing α-C:H.

REMARKS

This is in response to the final office action dated November 03, 2009. Reconsideration is respectfully requested in view of the amendments to the claims and arguments presented below. Claims 1, 2, 10–12 and 25 are pending in the application. Claims 1 and 10 have been amended to clarify the term "low surface energy" and to overcome the rejection of these claims under 35 U.S.C. §112, second paragraph. Claims 1, 2, 10–12 and 25 remain in the application.

Claim rejections under 35 USC § 112

Claims 1, 2, 10-12, and 25 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

This rejection is respectfully traversed. The specification provides at least a range for the definition "low active surface energy" by referring in paragraph **[0012]** to "polymer compounds with a low active surface energy, such as fluoropolymers." Although the examiner opines that one of ordinary skill in the art would not be reasonably apprised of the scope of the invention, Applicant wishes to point to a summary of free surface energy data of common polymers available on the Web under: http://www.surface-tension.de/solid-surface-energy.htm which gives for fluorides the following range:

Name	CAS Ref.-No.	Surface free energy (SFE) at 20 °C	
		in mN/m	in N/mm
Polyvinyl fluoride PVF	24981-14-4	36.7	0.0000367
Polyvinylidene fluoride PVDF	24937-79-9	30.3	0.0000303
Polytrifluoroethylene P3FE/PTrFE	24980-67-4	23.9	0.0000239
Polytetrafluoroethylene PTFE (Teflon™)	9002-84-0	20	0.0000200

Other non- fluoride compounds may have other values. It is therefore submitted that the term "low active surface energy" is not indefinite and requested that the rejection under 35 U.S.C. 112 be withdrawn.

Claim rejections under 35 USC § 102/103

The Examiner rejected Claims 1, 2, 10-12, and 25 under 35 U.S.C. 102(b) as being anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Chang et al. (Appl. Phys Lett. 51(2), 13 July 1987).
This rejection is respectfully traversed.

Claim 1, and similarly claim 10, recites an adhesive bond between a substrate material having material having a nano-indented surface and a nano-indented solid region proximate to the surface comprised of polymer compounds with a surface energy in a range of fluoropolymers, and a second material deposited particle-by-particle on the nano-indented surface of the substrate material while the nano-indented surface of the substrate material is in an energetically excited state. A nano-structured transition region comprising nano-composites is formed between the nano-indented substrate material and the second material in such a way that the transition region has a layer thickness between 20 nm and 20 μm and is predominantly formed of nano-composites. A ratio of substrate material to the second material in a direction transverse to the transition region changes from predominantly nano-indented substrate material in an immediate vicinity of the nano-indented substrate material to predominantly the second material in an immediate vicinity of the second material, with the nano-indented substrate material transitioning into the second material with a nano-structure.

The examiner correctly refers to the so-called "pre-sputtering" disclosed by Chang as altering the surface morphology of the PTFE, resulting in a textured surface. Chang thereafter deposits copper by vacuum-deposition (see page 103, 3rd paragraph left column to 1st paragraph right column). The deposited copper layer bonds with the pre-sputtered surface, and resembles the surface structure of the Teflon which with it was in contact before peeling (see page 103, 2nd paragraph left column). There is no suggestion and no experimental confirmation in the Chang article that the PTFE substrate intermixes at any place or time with

the deposited copper. In other words, the PTFE substrate and the Cu are physically separate across the entire sample.

Conversely, as recited in claims 1 and 10, a nano-structured transition region is formed in the adhesive bond between the substrate and the second material between the solid region of the nano-indented substrate and the second material, wherein the nano-structured transition region comprises predominantly nano-composites.

The examiner completely failed to address this important feature in the claims.

Nano-composites are defined in paragraph **[0014]** of the specification as follows:

> *In a nano-composite, materials with different properties penetrate each other over a region of a few nanometers. The fraction of both materials is almost uniform within a structural element, but changes over within the transition region formed by the structural elements (nano-composites) from the substrate material to the other material. Stated differently, nano-composites formed predominantly of substrate material are present proximate to the substrate material, followed by deposition of nano-composites with an increasingly larger fraction of the other material, until finally nano-composites predominantly of the other material are formed in the vicinity of the other material.*

Chang fails to disclose nano-composites with the defined properties.

Accordingly, Chang also fails to disclose that the "composition of the nano-composites changes from a composition substantially identical to that of the nano-indented substrate material proximate to the nano-indented substrate material to a composition substantially identical to that of the second material proximate to the second material" recited in claims 1 and 10, because Chang's Teflon substrate does not intermix with the deposited Cu layer and hence does not form the nano-composites required in these claims.

Applicant therefore submits that Chang neither anticipates nor renders unpatentable claims 1 and 10

and that claims 1 and 10 are therefore allowable. Claims 2 and 25, which depend from claim 1, and claims 11 and 12, which depend from claim 10, are then also allowable for at least the reasons that claims 1 and 10 are allowable.

Withdrawal of all rejections under 35 U.S.C. §112, second paragraph, and 102/103 is respectfully requested. Applicant also requests that this amendment be entered after final rejection, because the prior art of record was misapplied and no new search is required for the amendments made to overcome the §112 rejection.

CONDITIONAL PETITION FOR EXTENSION OF TIME

If entry and consideration of the amendments above requires any further extension of time, Applicants respectfully requests that this be considered a petition therefore. The Commissioner is authorized to charge any fee(s) due in this connection to Deposit Account No. 14-1263.

ADDITIONAL FEE

Please charge any insufficiency of fees, or credit any excess, to Deposit Account No. 14-1263.

Respectfully submitted,

NORRIS MCLAUGHLIN & MARCUS, P.A.

By __/Christa Hildebrand/_____

Christa Hildebrand - Reg. No. 34,953
875 Third Avenue, 8th Floor
New York, New York 10022
Tel. 212-808-0700
Fax. 212-808-0844